FROM ASHES TO GRASSES:

The Correlation Between Wildfire Disturbance and Cheatgrass Invasion

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Introduction

Background

- Cheatgrass (Bromus tectorum) (*Fig 1.*) is an invasive plant species that thrives in disturbed regions, grows fast while absorbing large amounts of nutrients and water, and whose litter is highly flammable, significantly increasing wildfire risk before fire season[3]
- Native perennial species in the Foothills of Northern Colorado have been observed to be resistant to invasion due to the region's summer-wet conditions[2]
- In recent decades, wildfire disturbance has become increasingly frequent and erratic across the Rocky Mountains, reshaping the natural ecosystems we call home and providing an opportunity for Cheatgrass to invade

Fig 1.
Bromus tectorum.
Adapted from Thome (1885).

Purpose

- **This research project investigates how the presence of Cheatgrass differs on post-fire landscapes with varying degrees of burn severity in the Foothills of Northern Colorado**

Methods

Site Selection

- This study was conducted at Walker Ranch in Boulder, Colorado (*Fig. 4)*, over the burned regions caused by the 2000 Eldorado fire
- Transect locations were selected through stratified random sampling along three burn severity categories (low, moderate, high) and two aspect categories (North, South) using data obtained from the Monitoring Trends in Burn Severity (MTBS) dataset (*Fig. 2*)

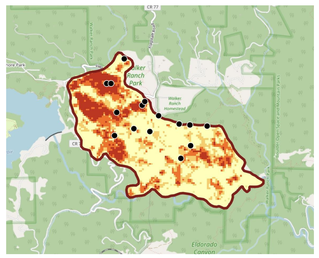


Fig 2. Transect Locations on the 2000 Eldorado fire map.

Fig 3. Walker Ranch Open Space. Reproduced from Boulder County Parks & Open Space (n.d.).

Data Collection

- Cheatgrass and surrounding vegetation's frequency and abundance were recorded along a 50m × 2m belt transect, with ten 2m × 1m quadrats (*Fig 6.*)
  - Frequency determined by a pin-drop technique
  - Abundance determined by visual percent estimates in 1m × 1m Daubenmire squares (left and right sides of the quadrats)
- Surrounding vegetation was separated into four groups (graminoids, woody shrubs, succulents, and forbs)
- Four additional cover categories were recorded (bare ground, rock, litter, woody debris)
- Transect downslope direction (aspect) was recorded to distinguish North and South mountain face microclimates (*Fig 4., Fig 5.*)

Fig 4.
North-facing slope

Fig 5.
South-facing slope

Results

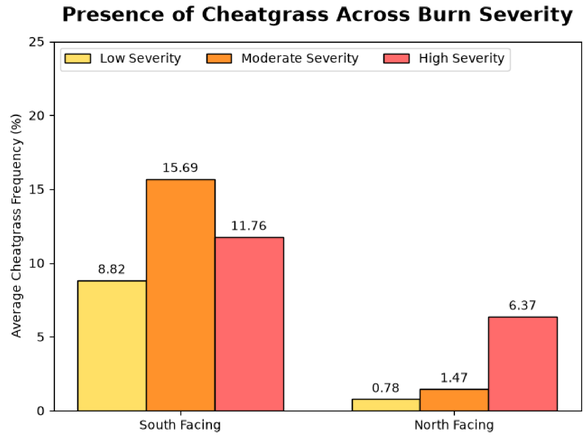


Fig 7. Bar graph demonstrating the difference in Cheatgrass presence in low, moderate, and high burn severity between North and South-facing aspects

- Cheatgrass frequency was greater on south-facing aspects than on north-facing aspects in all three categories of burn severity (Fig. 7).
- Burn severity categories low and moderate on north-facing aspects had a low Cheatgrass frequency, while north-facing, high-severity burned regions had higher observed Cheatgrass frequency (Fig. 7).

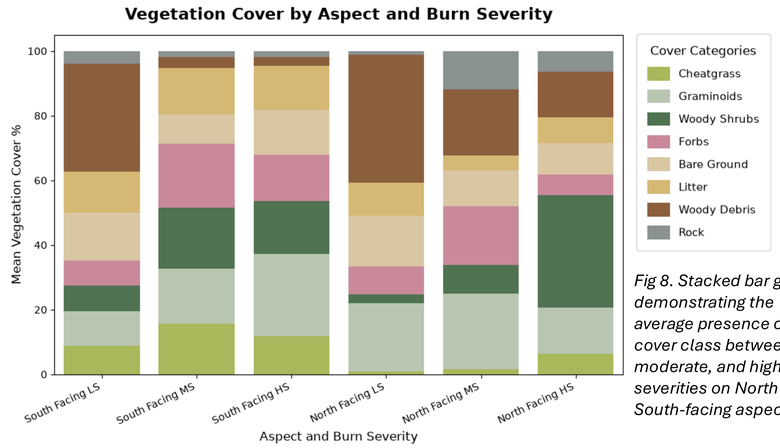
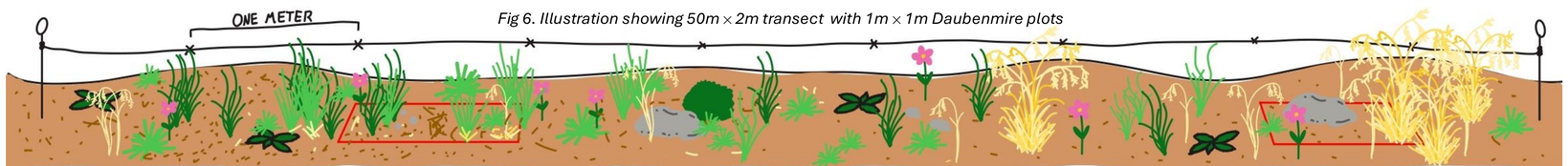


Fig 8. Stacked bar graph demonstrating the average presence of each cover class between low, moderate, and high burn severities on North and South-facing aspects

- Forbs, bare ground, litter, and woody shrub frequency showed patterns comparable to Cheatgrass frequency across all burn severities (Fig 8.)
- Graminoid frequency was higher than Cheatgrass frequency on north-facing aspects (Fig 8.)
- Woody-debris frequency decreased as burn severity increased on both north- and south-facing aspects (Fig 8.)

Fig 6. Illustration showing 50m × 2m transect with 1m × 1m Daubenmire plots



Discussion

- Higher cheatgrass frequency recorded on south-facing aspects (Fig 7.) suggests that drier, south-facing microclimates may be more susceptible to cheatgrass establishment after wildfire disturbance[1]
- Previous observations of native perennials in the Foothills of northern Colorado found that over long periods of time, the presence of cheatgrass declined[2]. Since the Eldorado wildfire took place 26 years ago, the higher cheatgrass frequency in high-severity, north-facing areas (Fig 8.) suggests that greater wildfire disturbances are likely to decrease this resistance
- However, previous studies in the western Great Plains and Colorado Front Range found that fire did not promote cheat grass abundance[4]. This suggests that post-fire cheatgrass growth may depend on burn severity and surrounding vegetation, as well as specific site conditions. Because this study was observational, the results do not establish that burn severity directly caused greater cheatgrass frequency.

Future Work

- The period this study took place over presented time constraints on both the amount and variety of field data collected. Future work should be done over longer periods of time and with a variety of wildfires that occurred throughout different regions of the northern Colorado Foothills.
- Furthermore, considering different natural and human-caused disturbances that may have taken place before or after the wildfire could result in more well-rounded results

Acknowledgements

- Thank you to Emily Nagamoto, Dr. Katherine Siegel, the RECCS cohort and staff, and to the Future of Working Landscapes lab for your support in furthering my research experience through your support, guidance, and feedback. I also thank Boulder County Parks & Open Space for access to the Walker Ranch study site.
- This research was conducted through the Research Experience for Community College Students (RECCS) program, led by the CIRES Center for Education, Engagement, and Evaluation and supported by CIRES and the Nation Science Foundation
- This project was funded by EARTh Center NSF Grant Number 2055370

References